

**Amendment to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

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1. -10. (cancelled)

11. (new) A network forwarding device connecting a plurality of networks comprising:

a port to which one of said networks is connected;

 a network interface connected to said port and controlling an interface with the network connected to said port; and

a routing processor connected to said network interface via an intra-device communication line and performing routing of a packet received from said network interface;

wherein said routing processor includes:

path information generating unit for generating path information comprising a plurality of 2-branch tree nodes, each corresponding to a value which can be taken by each bit of a destination address of said packet;

path information holding means for holding said path information generated; and

next-path searching means for checking each bit of said destination address

of said packet received from a high-order bit one by one and determining a path to which said packet received is to be forwarded next by retrieving said 2-branch tree nodes of said path information corresponding to each bit value of said destination address; and

wherein, said path information generating unit combines a total of  $(2^P-1)$  2-branch tree nodes comprising one 2-branch tree node and 2-branch tree nodes of  $(p-1)$  levels connected to said one 2-branch tree node, into one  $2^P$ -branch tree node and outputs said one  $2^P$ -branch tree node as said path information to said path information holding means, wherein said  $p$  is an integer equal to or larger than 2, and

wherein said next-path searching means checks  $p$  bits of said destination address of said packet received at one time and retrieves  $2^P$ -branch tree node corresponding to values of said  $p$  bits.

12. (new) The network forwarding device according to claim 1 wherein said  $2^P$ -branch tree node is formed by combining  $2^{(P-1)}$  2-branch tree nodes, and said  $2^P$ -branch tree node comprises path data included in said  $(2^P-1)$  2-branch tree nodes, and when each of said  $(2^P-1)$  2-branch tree nodes includes the same data, said  $2^P$ -branch tree node comprises said same data as one data.

13. (new) The network forwarding device according to claim 3 wherein said next-path searching means does not read a whole node when reading the  $2^P$ -branch tree node from said path information holding means but reads only data

corresponding to one of the  $2^{(P-1)}$  2-branch tree nodes combined when the  $2^P$ -branch tree node was created.

14. (new) The network forwarding device according to claim 4, wherein said path information generating unit stores mask length corresponding to said  $2^P$ -branch tree node, not mask length corresponding to other  $2^P$ -branch tree node storing a pointer for said  $2^P$ -branch tree node,

and wherein said next-path searching means comprehends mask length corresponding to said  $2^P$ -branch tree node to be read later, when data of said other  $2^P$ -branch tree node is read and selects a portion of data to be read from said  $2^P$ -branch tree node according to values of p bits beginning from a bit position indicated by said mask length in said destination address of said packet received.

15. (new) The network forwarding device according to claim 4 wherein said  $2^P$ -branch tree node comprises a flag as a data which is first read by said next-path searching means, said flag indicating whether or not a path is allocated to said  $2^P$ -branch tree node,

and wherein when said next-path searching means reads said  $2^P$ -branch tree node from said path information holding means, said flag is first read, and when said flag indicates that a path is not allocated, said next-path search means does not read path data.

16. (new) The network forwarding device according to claim 1 wherein said network forwarding device is a router.

17. (new) The network device according to claim 1, wherein said path information generating unit generates  $2^m$   $2^P$ -branch tree nodes ( $2^m \times (2^P-1)$ ) 2-branch tree nodes, said  $2^m$   $2^P$ -branch tree nodes respectively corresponding to mask lengths from m bit to (m-(p-1)) bit, wherein said m is a natural number, and wherein each  $2^P$ -branch tree node is stored in a predetermined region of said path information holding means, and

wherein said next-path searching means selects one region among regions storing each  $2^P$ -branch tree node according to a value represented by bits 0-th bit to (m-1)th bit of said destination address of said packet received, and reads one  $2^P$ -branch tree node from said region selected in said path information holding means.

18. (new) A network forwarding device connecting a plurality of networks comprising:

a port to which one of said networks is connected;  
a network interface connected to said port and controlling an interface with the network connected to said port; and  
a routing processor connected to said network interface for performing routing of a packet received from said network interface;  
a management unit connected to said routing processor via an intra-device

communication line for generating path information and delivering said path information to said routing processor, said path information including a plurality of 2-branch tree nodes, each corresponding to a value can be taken by each bit of a destination address of a packet;

wherein said routing processor includes:

a memory for holding said path information delivered from said management unit; and

next-path searching means for checking each bit of said destination address of said packet received from a high-order bit one by one and determining a path to which said packet received is to be forwarded next by retrieving said 2-branch tree nodes of said path information corresponding to each bit value of said destination address; and

wherein, said management unit combines a total of  $(2^P-1)$  2-branch tree nodes comprising one 2-branch tree node and 2-branch tree nodes of  $(p-1)$  levels connected to said one 2-branch tree node, into one  $2^P$ -branch tree node and delivers said one  $2^P$ -branch tree node as said path information to said routing processor, wherein said  $p$  is an integer equal to or larger than 2, and

wherein said next-path searching means checks  $p$  bits of said destination address of said packet received at one time and retrieves said  $2^P$ -branch tree node corresponding to values of said  $p$  bits.

19. (new) A network next-hop search method for use in a network forwarding

device connected to a plurality of network and transmitting a packet received from one of said networks to a next hop based on path information comprising the steps of:

generating path information comprising a plurality of 2-branch tree nodes, each corresponding to a value which can be taken by each bit of a destination address of a packet;

holding said path information generated;

checking bits of said destination address of said packet received from a high-order bit one by one and retrieving said 2-branch tree nodes corresponding to each bit value; and

determining a path to which said packet received is to be forwarded next wherein, said step of generating a path information combines a total of  $(2^p-1)$  2-branch tree nodes comprising one 2-branch tree node and 2-branch tree nodes of  $(p-1)$  levels connected to said one 2-branch tree node, into one  $2^p$ -branch tree node as said path information, wherein  $p$  is an integer equal to or larger than 2,

and said step of retrieving checks  $p$  bits of said destination address of said packet received at one time and retrieves said  $2^p$ -branch tree node corresponding to values of said  $p$  bits.